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3−D Configuration of Teleost Lateral line Scales and the Lateral Line Canal Contained Within Them: The Textbooks are Wrong

The lateral line (LL) scales are an important functional component of the mechanosensory lateral line system of bony fishes and a source of meristic characters for taxonomic study. A section through the overlapping scales that compose the LL canal is a common illustration in most comparative anatomy and ichthyology textbooks. Upon dissection, it is clear that the scales sit in the dermis, each flat LL scale contains a tubular LL canal segment, and adjacent scales overlap so that the canal segments in the linear series of scales form a continuous canal (the trunk canal). However, these observations are not consistent with the diagrammatic illustrations of the LL scales provided in textbooks. Thus, we re−examined the 3−D configuration of the lateral line scales and the lateral line canal contained with them, using histological sections cut through the trunk canal of embiotocids, pomacentrids and pleuronectids (n=10 spp.) which all have well−developed trunk canal and unremarkable LL scales. The 3−D configuration of the LL scale and LL canal was consistent within and among the families examined, with some variation. The scales overlap (to various degrees; no overlap in pleuronectids) and sit at a shallow angle relative to each other. The LL canal runs parallel to the skin surface and its lumen (which varies in diameter, among pleuronectids) runs through the tubular canal segments in the LL scales. A neuromast receptor organ is found in the canal segment in each scale, and pores (not apparent in pleuronectids) are simply perforations in the overlying epithelium between scales. The 3−D relationship of LL scales and tubular canal segments and neuromast location in canal segments are thus dramatically different than that portrayed in textbooks, as well as on the WWW where inaccurate anatomy can rapidly and reliably perpetuated.

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The "Out of Classroom" Experience: Teaching Marine Biology at the University of Rhode Island

For students in Marine Biology and Environmental Sciences, field work generates a great deal of excitement, and we all recognize that it is a critical component of their education. However, the campus−based courses that provide disciplinary training in biology and ancillary sciences makes it difficult to integrate more extensive or remote marine field experiences into a normal semester schedule (especially in seasonal New England). URI offers three very different intense field courses that take place outside of the normal semester. In "Marine Invertebrates of Southern New England" students study invertebrates in their backyards (literally) where local biodiversity is challenged by coastal development and the effects of climate change. "Pelagic Ecology" provides undergraduates with their first off−shore, deep water cruise experience aboard URI's 185' R/V *Endeavor* off the continental shelf, 120 miles due south of Rhode Island. Students collect delicate, little−known pelagic animals using sophisticated nets, conduct physiological experiments, and have the opportunity to observe these animals in situ while blue water diving. Finally, "Coral Reef Conservation and Analysis" is offered at a remote field site (a CIEE field station) in tropical Bonaire during J−term. The critical analysis of primary literature and local case studies is integrated with daily SCUBA−based investigations that allow students to hone practical skills with the goal of designing field studies that focus on solving conservation problems. The diversity of these very successful field courses complements more traditional campus−based courses. They give our students unique experiences that allow them to put their knowledge of marine biology into larger and more practical contexts, which is so critical for the cultivation of longer−term career interests.

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A Molecular Investigation into the Biodiversity and Biogeography of Antarctic Thouarella (Cnidaria: Octocorallia: Primnoidae)

Global climate change has had a profound impact on the health of Antarctic communities, but little is known about the ecosystems in this region. Found within the benthic communities of this area are members of the soft coral genus *Thouarella*. Few studies have been done to investigate the species richness of this genus in the Antarctic despite these organisms playing an important role in benthic communities and providing habitat for Antarctic annelids. We used a DNA barcoding approach to investigate the biodiversity of Antarctic *Thouarella* species using mitochondrial DNA sequences. Geographical distributions of identified species were examined to assess differences in distributions among species and population connectivity. This study will provide a better understanding of species−level diversity in *Thouarella* and population structure around the Antarctic continent.

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Changes in digestive performance and gut structure and function in a newly herbivorous lizard

Although evolution is generally thought to happen over long timescales, examples of rapid evolutionary change are becoming more common. One example, a population of Italian Wall Lizards (*Podarcis sicula*) in Croatia has become primarily herbivorous and morphologically distinct from its source population in ~30 generations. By studying what these animals are ingesting and digesting, we can investigate if their physiology and morphology are optimized for their diets. The Adaptive Modulation Hypothesis posits diet specialization should lead to gut specialization. With previously documented changes in diet and gut structure in these lizards, we hypothesized concomitant changes in gut function to accommodate a plant diet. Indeed, we found the herbivorous population was more efficient at digesting plants than the source population lizards. Thus, we compared the gut morphology and physiology of the herbivorous population, its source population, and two outgroup populations of *P. sicula* to discern the mechanisms of their digestive capabilities. We expected the plant−eating population would have increased gut length and intestinal surface area to absorb nutrients. We found differences in gut length by population and sex, but not in intestinal cross sectional area. We anticipated higher carbohydrase activities in the herbivorous population, but have found inconsistent patterns across populations and enzymes. In experiments underway, we predicted the herbivorous population would have increased microbial fermentation and food transit time, as is found in other herbivorous lizards. In progress metabolic measurements aim to investigate effects of diet and diet specialization on performance. Our study addresses mechanisms of how diet specializations arise and their effects on fitness.